

intel[®] Mobile Celeron[™] Processor

Performance Brief

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1.0 Introduction

The mobile Intel Celeron™ processors at 700 MHz, 650 MHz, 600 MHz, 550 MHz, 500 MHz, 450 MHz, low voltage 500 MHz¹, 400MHz¹, and ultra low voltage 500 MHz² feature Intel's advanced 0.18 micron process technology and are the newest members of the Intel processor family that provide outstanding performance for all mobile applications at an exceptional value. These processors offer new features like the addition of Internet Streaming SIMD instructions and support for processor system bus speed of 100 MHz. All these mobile Celeron processors feature an on-die 128-Kbyte L2 cache for higher levels of performance for new mobile PCs.

This brief provides performance results for the following mobile Intel Celeron processors while using an Intel 440BX chipset and running a variety of benchmarks. The performance is normalized to the mobile Celeron processor at 400A MHz with a 100-MHz PSB:

- Mobile Celeron Processor at 700 MHz with 100 MHz PSB
- Mobile Celeron Processor at 650 MHz with 100 MHz PSB
- Mobile Celeron Processor at 600 MHz with 100 MHz PSB
- Mobile Celeron Processor at 550 MHz with 100 MHz PSB
- Mobile Celeron Processor at 500 MHz with 100 MHz PSB
- Mobile Celeron Processor at 450 MHz with 100 MHz PSB
- Mobile Celeron Processor at low voltage 500 MHz with 100 MHz PSB
- Mobile Celeron Processor at low voltage 400A MHz with 100 MHz PSB
- Mobile Celeron Processor at ultra low voltage 500 MHz with 100 MHz PSB

Today's microprocessor performance can be best assessed using the Spectrum of Performance:

- **Productivity Benchmarks** simulate the activities of end users working in typical productivity applications such as word processing, spreadsheets, presentation applications, and personal finance programs.
- **Multimedia Benchmarks** are designed specifically to simulate the activities of end users utilizing video, digital sound, PC imaging or Video Conferencing, and other similar media-rich applications.
- **3D/Floating-Point Benchmarks** measure the performance of three-dimensional visualization techniques, as those used in games to support richer textures and enhanced lighting effects.

Endnotes

¹ The low-voltage mobile Celeron processor at 500 MHz and 400A MHz operates at core V_{CC} of 1.35V

² The ultra low-voltage mobile Celeron processor at 500 MHz operates at core V_{CC} of 1.10V

- **Internet Technology Benchmarks** evaluate processor Internet performance on browser, 3D, and multimedia technologies.

Representative integer benchmarks include: Processor Level Benchmarks- SPECint*95; System Level Benchmarks-SYSmark*2000, Winstone*99, and the processor component of WinBench*99 from Ziff-Davis*.

Representative multimedia benchmarks include: MultimediaMark* 99 from FutureMark* Corp., Intel MMX™ Technology Applications, as well as Intel Media Benchmark.

Representative floating-point benchmarks include: the FPU component of WinBench*99 from Ziff-Davis*, 3DMarkCPU from 3Dmark, WinBench*98 FPU, and SPECfp base*95.

Representative Internet benchmarks include: the productivity, 3D, and multimedia benchmarks listed above. Additionally, the Java Internet technology benchmark is are JMark*2.0 Processor Test for the processor level benchmark and SYSmark*J for the system level.

This report provides benchmark results for the Intel mobile Celeron processor family. Modern, industry-standard benchmarks were chosen to demonstrate capabilities across the Spectrum of Performance. The benchmarks include:

- Productivity performance can be measured using system-level benchmarks such as BAPCO*'s SYSmark* 2000 and Ziff-Davis*' Winstone* 99.
- Multimedia performance can be compared with Futuremark's* MultimediaMark* 99 benchmark.
- 3D/Floating-point performance can be measured with the floating-point benchmarks such as Ziff-Davis*' WinBench* 98 FPU.
- Java aspects of the Internet experience can be measured by BACPO*'s Sysmark*J

Intel is committed to using the most robust and relevant benchmarks in characterizing the performance of its products, and Intel will adapt this mix over time as newer benchmarks are introduced into the PC market.

System performance does not depend on the microprocessor alone. Hardware and software system components—such as the operating system, the graphics and I/O subsystems, application software, and memory—may significantly affect benchmark results. For this reason, this Performance Brief illustrates mobile Celeron processor performance on a consistent system configuration. Details of the system configuration used for the benchmarks throughout this brief can be found in Appendix A.

1.1 The Mobile Intel Celeron Processor

Mobile Intel Celeron processors at 700 MHz, 650 MHz, 600 MHz, 550 MHz, 500 MHz, 450 MHz, low voltage 500 MHz, 400A MHz, and ultra low voltage 500 MHz deliver excellent performance for all IA architecture based PC software. They are fully compatible with the existing base of PC software written for the mobile Pentium® III processor, mobile Pentium® II processor, mobile Celeron processor, mobile Pentium processor, Intel486™ processor, and Intel386™ processor. Additionally, this new generation of processors enables higher levels of multimedia and communication performance. It has immediate responsiveness for the latest, most demanding software with powerful, realistic graphics and the ability to run full-screen, full-motion video.

2.0 Mobile Celeron Processor Feature Highlights

The mobile Celeron processor allows exceptional value notebooks to be designed for today's mobile applications by providing the following features:

- 700 MHz, 650 MHz, 600 MHz, 550 MHz, 500 MHz, 450 MHz, low voltage 500 MHz, low voltage 400A MHz, and ultra low voltage 500 MHz core CPU
- Integrated 16 Kbytes of Data and 16Kbytes of Instruction Level-One Cache
- Integrated on-die 128 Kbytes Level-Two Cache
- Low Power GTL+ Processor System Bus Interface operating at 66/100 MHz³
- Integrated Floating-Point Unit
- 64-bit External Data Bus
- Supports the Intel Architecture MMX™ technology
- Support for Internet Streaming SIMD instructions⁴
- Supports the Intel Architecture with Dynamic Execution
- Quick Start Mode for low power, fast exit (low latency) clock “throttling”
- Deep Sleep mode for extremely low-power dissipation
- Integrated Thermal Diode
- High-Reliability Error Detection

Endnotes

³ 100-MHz PSB support available only in mobile Celeron processors at 700 MHz, 650 MHz, 600 MHz, 550 MHz, 500 MHz, 450 MHz, and 400A MHz

⁴ Available only in mobile Celeron processors at 700 MHz, 650 MHz, 600 MHz, 550 MHz, 500 MHz, 450 MHz, and 400A MHz

3.0 Mobile Microprocessor Performance Summary

3.1 Productivity Benchmarks

The 32-bit Integer Windows performance of the mobile Intel Celeron processor is illustrated by the following benchmarks:

3.1.1 SYSMark*2000

SYSMark 2000 is a suite of application software and associated benchmark scripts developed by the Business Applications Performance Corporation (BAPCO), a non-profit consortium of PC OEMs, software vendors, semiconductor manufacturers, and industry publications. SYSMark 2000 is a tool that measures system performance on popular business-oriented applications in the Microsoft* Windows operating environment. SYSMark 2000 contains 12 application workloads that are divided into two categories: office productivity and Internet content creation.

SYSMark 2000 includes 32-bit benchmark scripts for the following categories and applications:

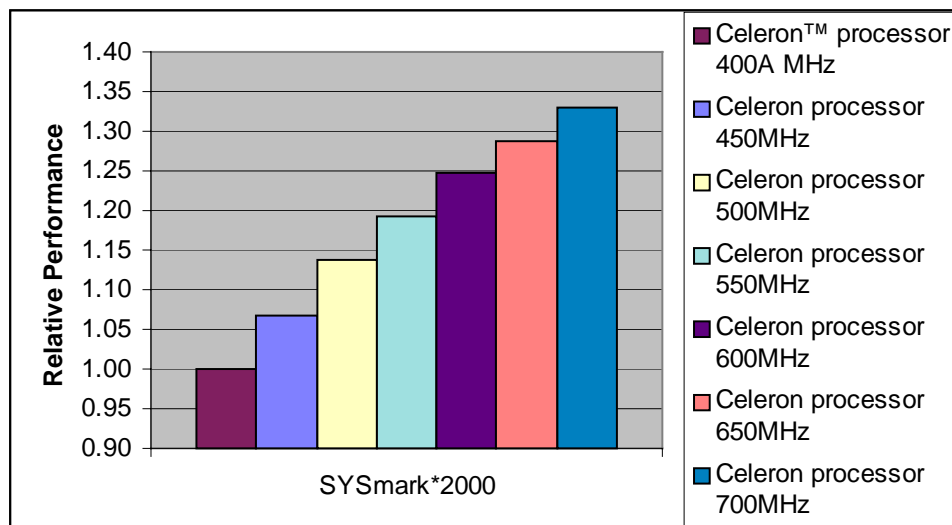
Office Productivity:

- Corel* CorelDRAW* 8
- Microsoft Excel* 97
- Dragon Systems* Naturally Speaking* 2.02
- Netscape* Communicator* 4.05
- Caere* OmniPage Pro* 8.0
- Corel Paradox* 8.0
- Microsoft PowerPoint* 97
- Microsoft Word* 97

Content Creation:

- MetaCreations* Bryce* 2
- Avid* Elastic Reality* 3.1
- Macromedia* Extreme3D * 2
- Adobe* Photoshop* 4.0.1
- Adobe Premiere* 4.2
- Xing Technology* XingMPEG* Encoder* 2.1

Figure 1. Mobile Celeron Processor Relative Performance for SYSmark*2000

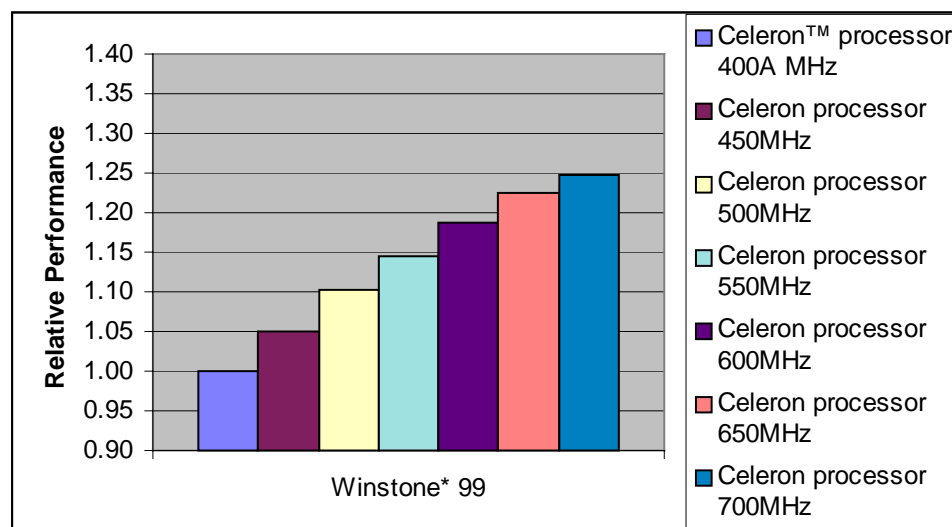


3.1.2 Winstone*99

Winstone* 99 is a system-level, application-based benchmark developed by Ziff-Davis*. Winstone* 99 measures a PC's overall performance when running Windows-based 32-bit applications on Windows* 98 or Windows* NT 4.0. It runs real 32-bit business suites through a series of scripted activities and uses the time a PC takes to complete those activities to produce its performance scores.

Winstone* 99 incorporates the following popular office software suites: Corel* WordPerfect* Suite 8, Lotus SmartSuite*, and Microsoft Office* 97. To mirror the typical usage patterns of today's PC users, the benchmark keeps multiple applications open within each suite, and switches tasks between these applications and Netscape Navigator Internet browser. (source: Ziff-Davis*)

Figure 2. Mobile Celeron Processor Relative Performance for Winstone*99

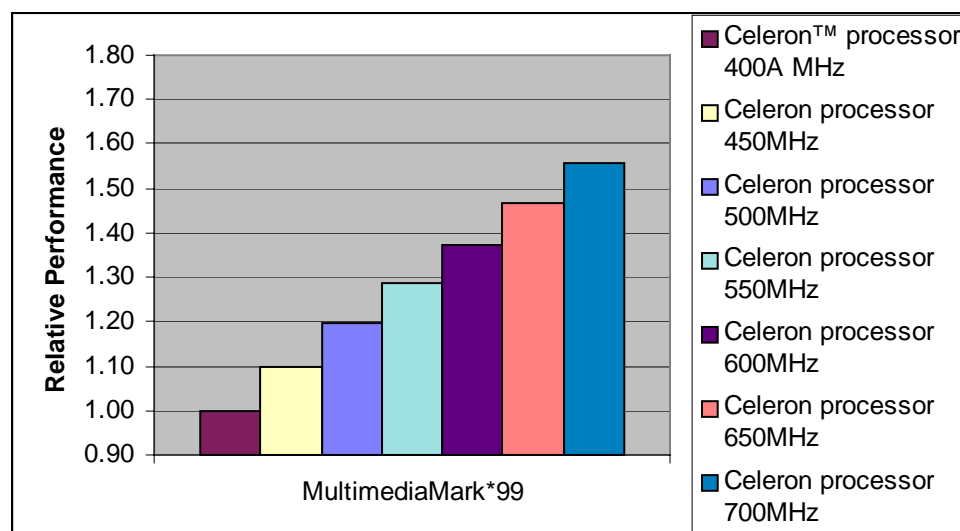


3.2 Multimedia Benchmarks

3.2.1 MultimediaMark*99

The MultimediaMark* 99 is a system level benchmark from FutureMark* Corp. that measures audio, video, and imaging performance. MultimediaMark* 99 is a benchmark that focuses on testing multimedia performance of modern PC in a "real world" environment. Figure 3 illustrates the relative performance comparison of the Intel mobile Celeron processors when executing the MultimediaMark* 99 benchmark.

Figure 3. Mobile Celeron Processor Relative Performance for Multimediamark*99 Benchmark



3.3 3D/Floating-Point Benchmarks

The floating-point performance of the Intel mobile Celeron processor is illustrated by the following benchmark:

3.3.1 WinBench*98 FPU

Business WinBench*98 is a subsystem-level benchmark that measures the performance of a PC's graphics, disk, processor, video, and CD-ROM subsystems in a Windows*-based environment. WinBench 98's tests are all 32-bit and can only run on Windows*95, Windows*98, and Windows*NT systems.

We used the FPU WinMark* components of this benchmark for comparing floating-point performance in this report.

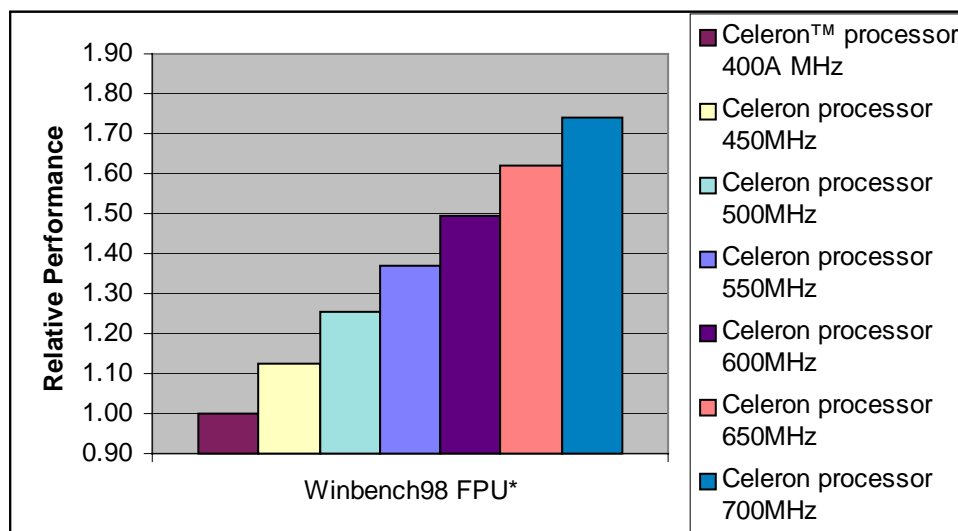
The Business applications and the categories in which the benchmark groups them are:

- Business Browsers: Netscape Navigator*
- Business Publishing: Corel DRAW!* 7, Microsoft PowerPoint*98

- Business Spreadsheet/Database: Microsoft Access*98, Microsoft Excel*98, Lotus 1-2-3* 98, Corel Quattro Pro*7
- Business Word Processing: Microsoft Word* 98, Corel WordPerfect* 7 (source Ziff-Davis*)

Figure 4 illustrates the relative performance comparison of the Intel mobile Celeron processors when executing the WinBench98 FPU* benchmark.

Figure 4. Mobile Celeron Processor Relative Performance for Winbench98 FPU*

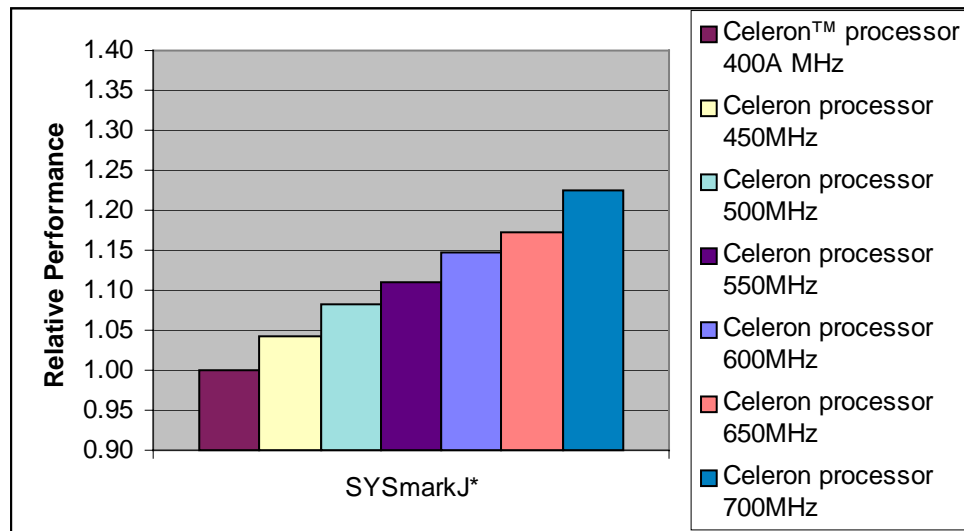


3.4 Internet Technology Benchmarks

3.4.1 SYSmark*J

SYSmark J is a Java benchmark suite designed and developed by the Business Applications Performance Corporation (BAPCO). It allows performance comparisons across platforms that support Java Development Kit Version 1.1 (JDK1.1). SYSmark J is a collection of four applications covering word processing, spreadsheet, image processing, and multimedia.

Figure 5. Mobile Celeron Processor Relative Performance for SYSmarkJ*



4.0 Summary

Table 1 summarizes the microprocessor benchmark relative performance results for the mobile Celeron processors discussed in this performance brief.

Table 1. Mobile Celeron Processor Benchmark Results

Processor	Winstone* 99	SYSmark* 2000	MultimediaMark* 99	Winbench98 FPU*	SYSmarkJ*
Mobile Celeron Processor at 400A MHz with 100-MHz PSB	1.00	1.00	1.00	1.00	1.00
Mobile Celeron Processor at 450 MHz with 100-MHz PSB	1.05	1.07	1.10	1.13	1.04
Mobile Celeron Processor at 500 MHz with 100-MHz PSB	1.10	1.14	1.20	1.25	1.08
Mobile Celeron Processor at 550 MHz with 100-MHz PSB	1.14	1.19	1.29	1.37	1.11
Mobile Celeron Processor at 600 MHz with 100-MHz PSB	1.19	1.25	1.37	1.49	1.15
Mobile Celeron Processor at 650 MHz with 100-MHz PSB	1.22	1.29	1.47	1.62	1.17
Mobile Celeron Processor at 700 MHz with 100-MHz PSB	1.25	1.33	1.56	1.74	1.23

Appendix A System Configuration

Table 2 shows the system and its configuration used for evaluating the benchmark performances discussed in this brief.

Table 2. System Configuration Used in Benchmark Tests

Processor	Mobile Celeron Processor at 700/650/600/550/500/450/400A MHz
OEM's System	Gateway* Solo* 25XX with mobile Celeron processor with Intel 440BX Chip Set
Primary Cache	16-Kbyte (Instruction) 16-Kbyte (Data)
Secondary Cache	On-die 128 Kbytes
System Memory Size/Speed	64 Mbytes SDRAM
Motherboard Chip Set	Intel 82440BX
Hard Disk	IBM 10 GB*
Media	SD-C2202 DVD ROM
Operating System	DirectX version 7.00G, Windows* 98 for all benchmarks
Video Controller	NeoMagic* 256ZX* graphics controller